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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/574,038
Filing Date: March 27, 2006
Appellant(s): HOSAKA ET AL.

Francine Nesti
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed August 4, 2010 appealing from the Office action mailed February 22, 2010.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds

of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

Number	Name	Date
US 6,664,006	Munshi et al.	12-2003
JP 2004-179053 A	Fukuwaza et al.	6-2004
US 2004/0126655	Hisamitsu et al.	7-2004
US 2005/0084760	Hwang et al.	4-2005
US 6,656,232	Usui et al.	12-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. Claims 24 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Munshi (US 6,664,006).

Regarding claims 24 and 25, Munshi teaches stackable solid-state electrochemical cells, such as ultra-thin bipolar batteries with bipolar electrode structures having a polymer substrate serving as the film bipolar element (bipolar electrode stack) (9:36-40, 26:4-7, 29:1-7, 29:20-22). The bipolar structure is made by laminating anode and cathode active elements to opposing sides of a polymer substrate

(collector) (26:7-18). The polymer substrate can include polyester (PET) impregnated with an electronically conducting polymer, such as polyacetylene, polypyrrole, polyaniline, etc. (21:66-22:8, 22:18-27, 22:28-43, 22:49-50, 26:11-14).

2. Claim 24 is rejected under 35 U.S.C. 102(b) as being unpatentable over Fukuzawa et al. (JP 2004-179053 A; refer to JPO Abstract and machine translation).

Regarding claim 24, Fukuzawa teaches a bipolar battery laminating bipolar electrodes (bipolar electrode stack) in which a positive active material layer 3 (cathode) is formed on one side of a current collector 2 and a negative active material layer 4 (anode) on the other side on both sides of a gel electrolyte layer 5 (Abstract; Drawing 1). The current collector is composed of a metal powder and resin binder (machine translation, para. 36). The resin binder may be, for example, an epoxy or a conductive polymer (para. 37).

Claim Rejections - 35 USC § 103

3. Claims 1, 3, 8, 10, 11, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatantable over Munshi in view of Hisamitsu et al. (US 2004/0126655; cited in IDS).

Regarding claims 1, 3 and 22, Munshi teaches stackable solid-state electrochemical cells, such as ultra-thin bipolar batteries with bipolar electrode structures having a polymer substrate serving as the film bipolar element (bipolar electrode stack), as discussed above with respect to claims 24 and 25 above. The reference also teaches that the polymer substrate (collector) is impregnated with conductive materials, such as a carbon black or metallic elements, dispersed throughout the polymer material of the substrate (26:7-18). The polymer material forming the polymer substrate described above includes polyester (PET) (high-polymer material) (21:66-22:8, 22:18-27, 22:28-43, 22:49-50, 26:11-14). (One would appreciate that "PET" is the acronym for polyethylene terephtalate.) The impregnated substrate, highly desirable for

bipolar designs, can be metallized; however, metallization of the substrate is optional (22:49-50, 22:52-53).

Munshi does not expressly teach that the electrically conductive particles include a first type and a second type of electrically conductive particle, where the first type contacts the cathode and the second type contacts the anode.

Hisamitsu teaches a bipolar, laminate type battery including at least one cell composed of a positive electrode layer, an electrolyte layer, and a negative electrode layer sandwiched by collecting layers from both sides thereof (Abstract; para. 27; Fig. 2). The collecting layers contacting the positive and negative electrode layers can be made of different material, i.e., the collecting layers may include two types of layers (para. 36, 46).

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate two types of electrically conductive particles in the collector used in the bipolar electrode stack of the battery of Munshi, where the first type contacts its cathode and a second type contacts its anode, because Hisamitsu teaches that the use of differing conductive material in portions of a collector contacting opposing battery electrodes is effective in moving current from these electrodes.

Regarding claim 8, Munshi also discloses that opposite ends an electrochemical cell can have a layer of metal sprayed onto them to serve as battery terminations (electrode extracting plates) (25:46-49).

Regarding claims 10, 11 and 23, Munshi teaches that the batteries can be stacked in rectangular prismatic modules (battery module) and may be used as a cost-effective power source for an electric vehicle (6:33-44, 29:30-34). The remaining limitations recited in claim 10, and those recited in claim 23, have been addressed above with respect to claims 1 and 22.

4. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Munshi and Hisamitsu et al. as applied to claims 1, 3, 6, 8, 10 and 11, and further in view of Hwang et al. (US 2005/0084760).

Munshi and Hisamitsu are applied and incorporated herein for the reasons above.

Regarding claim 7, Munshi and Hisamitsu do not expressly teach that the high-polymer material exhibits a weight average molecular weight of from about 50,000 Daltons to about 1 million Daltons.

Hwang teaches a battery that includes a current collector having a polymer film with a metal deposited on the polymer film (Abstract; para. 12). The polymer film has a rigid characteristic which keeps it from stretching during the rolling step of the battery fabrication process while still having sufficient flexibility to be rolled during the fabrication process (para. 13). The polymer may be a polyethylene terephtalate, polyimide, polytetrafluoroethylene, polyethylene naphthalene, polyvinylidene fluoride, polypropylene, polyethylene, polyester, or polysulfone (para. 13). The polymer has a molecular weight of 10,000 to 7,000,000, and preferably 50,000 to 5,000,000 (para. 13).

Since it has been held that obviousness exists where the claimed ranges overlap or lie inside ranges disclosed by the prior art (e.g., *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990)), it would have been obvious to one of ordinary skill in the art at the time of the invention to form the collector used in the battery of Munshi, as modified by Hisamitsu, using a polymer with a weight as recited by the claim because Hwang teaches that polymers with weight within that range produce a strong, but flexible, film. See MPEP 2144.05 (I).

5. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Munshi and Hisamitsu et al. as applied to claims 1, 3, 7, 8, 10 and 11 above, and further in view of Usui et al. (US 6,656,232).

Munshi and Hisamitsu are applied and incorporated herein for the reasons above.

Regarding claim 9, Munshi teaches that opposite ends of its electrochemical cells have a layer of metal sprayed onto them to serve as battery terminations, as discussed above.

Munshi and Hisamitsu do not expressly teach that the sprayed metal forms a metal foil.

Usui teaches a method of manufacturing of a battery electrode (Title). The reference discuses that producing an electrode including a metal sprayed layer on one side of the electrode on which to weld the lead piece, a method of depositing metal foil in advance for reinforcement, etc., to improve the electric conductivity of a material core portion (1:41-48). It would have been obvious to one of ordinary skill in the art at the time of the invention to form the electrode extracting plate of Munshi by depositing a metal foil because Usui teaches that it is a method with which to produce an electrical contact within a battery.

6. Claims 12, 13, 16, 18, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Munshi in view of Hisamitsu et al.

Regarding claims 12, 13 and 16, the battery as taught by Munshi in view of Hisamitsu, as discussed above with respect to claims 1, 10 and 24, teaches the limitations recited in these claims, except that Munshi does not teach that the method of forming the bipolar electrode assembly includes use of an inkjet printing method or a curing step.

However, Hisamitsu teaches that the laminate type battery described above is manufactured by sequentially applying the plurality of fluids that form the components of the battery onto a substrate using an inkjet printer (para. 38, 52, 53, 54; Claims 9, 12). After the fluid is applied, a heat or optical treatment is performed for the film (the layer) formed by the fluid in order to accelerate evaporation of the solvent or solidification of the fluid (para. 39).

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to use an inkjet printing method to form the bipolar electrode assembly of Munshi, as modified by Hisamitsu, and to cure the assembly layers once formed, because Hisamitsu teaches that, since the pattern and the film thickness of each of the layers can be freely controlled, batteries having various capacities, sizes and shapes can be designed and manufactured easily (see Hisamitsu, para. 53-58); and, curing of the

layers can accelerate solidification (e.g., thermal polymerization) of the fluid (see also Hisamitsu, para. 52).

Regarding claims 18, 19 and 20, the limitations recited in these claims have been addressed with respect to claims 1, 10 and 24.

(10) Response to Argument

1. The status of claim 6 is unclear because the Examiner has not rejected claim 6 in the Final Office Action. (See Appeal Brief, p. 4.)

The limitations recited in claim 6 have been addressed in several previous Office Actions. (See Paragraph 3 on p. 2 of the Non-Final Office Action mailed on December 16, 2008; Paragraph 3 on p. 2 of the Final Office Action mailed on June 11, 2009; and, Paragraph 5 on p. 3 of the Non-Final Office Action mailed on September 16, 2009.)

2. "Applicant's claim [claim 24] requires that the collector consists essentially of an electrically conductive polymer. Munshi clearly describes a collector that has electrically conductive polymers metallized on both sides. ... Examiner states that ... the phrase "consisting essentially of" limits the scope of the specified materials and those that do not materially affect the basic and novel characteristics of the invention. ..., the specification makes clear in at least the passages cited that the basic and novel characteristics of the claims subject matter is the ability of the electrical current to flow in a vertical direction through the collector ..." (See Appeal Brief, p. 5-6.)

It is noted that the courts have held that a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham,* 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP 2114. The collector of Munshi can be in direct contact with the anode and cathode in its bipolar electrode structure because one would appreciate that the metallization layers, such as layers 16a, 16b included in the double-metallized electrode structure described by Munshi (see 25:34-46, Fig. 1C), are an optional element in its bipolar electrode structures as discussed rejection of claim 1 presented above (see Munshi, 22:49-50,

22:52-53). Since the collector as taught by the Munshi is structurally similar to that recited in claim 24, it appears that current could flow through that collector in a vertical direction.

3. The Furukawa reference "... does not meet the scope of claim 24, which requires the collector to consist essentially of an electrically conductive polymer. ... Examiner states that ... the phrase "consisting essentially of" limits the scope of the specified materials and those that do not materially affect the basic and novel characteristics of the invention. ..., the specification makes clear in at least the passages cited that the basic and novel characteristics of the claims subject matter is the ability of the electrical current to flow in a vertical direction through the collector ... Fukuwaza et al. clearly teaches that the metal powder is a necessary component of the collector disclosed, ...". (See Appeal Brief, p. 7-8.)

As discussed above, a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham,* 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP 2114. Since the collector as taught by the Fukuwaza is structurally similar to that recited in claim 24, it appears that current could flow through that collector in a vertical direction.

Further, if an applicant contends that additional steps or materials in the prior art are excluded by the recitation of "consisting essentially of," applicant has the burden of showing that the introduction of additional steps or components would materially change the characteristics of applicant's invention. *In re De Lajarte*, 337 F.2d 870, 143 USPQ 256 (CCPA 1964). See also *Ex parte Hoffman*, 12 USPQ2d 1061, 1063-64 (Bd. Pat. App. & Inter. 1989). Applicants have not described how the inclusion of a metal powder in a collector as taught by Fukuzawa would affect a flow of current through the collector in a vertical direction.

4. "Hitsamitsu et al. teaches the use of two collector layers. The layer contacting the anode may be different from the layer contacting the cathode. However, there is no teaching or suggestion of a single layer collector comprising two different types of particles, wherein the distribution of the particles within the collector may be changed. ... combining Hitsamitsu et al. with Munshi would suggest to one skilled in the art at the time the invention was made to use the anode and cathode collector layers of Munshi each

impregnated with a different type of particle. This is not within the scope of the claim. .... There is no teaching or suggestion in Hitsamitsu et al. to use a high-polymer material, as required by the claims. ... To one skilled in the art, the combined teachings of Hitsamitsu et al. and Munshi would discourage the use of a polymer in the collector as having to heat the polymer microcapsules [of Hisamitsu] to dissolve them after application would add time and cost to Munshi's "economical and high-speed method of manufacturing." ... Therefore, the cited combination of references does not teach, suggest or render obvious the elements of claim 1. ... [and]... does not teach, suggest or render obvious the elements of claim 10. ...". (See Appeal Brief, p. 9-11.)

First, as to applicant's arguments with respect to layers forming the collector, it should be noted that claim 1 only recites "A battery comprising: ... a collector, ..." with no recitation with respect to the structure of the collector of other than the inclusion of electrically conductive particles, and the disposition of those particles with respect to a cathode and an anode in contact with first and second sides of the collector. It should be noted that the transitional term "comprising", which is synonymous with "including," "containing," or "characterized by," is inclusive or open-ended and does not exclude additional, unrecited elements or method steps. See, e.g., *Mars Inc. v. H.J. Heinz Co.*, 377 F.3d 1369, 1376, 71 USPQ2d 1837, 1843 (Fed. Cir. 2004). See also MPEP 2111.03.

Second, as to combination of the Munshi and Hisamitsu references, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, Hisamitsu teaches that the collecting layers contacting the positive and negative electrode layers in its bipolar, laminate type battery can be made of different material, i.e., the collecting layers may include two types of layers (para. 36, 46). The collecting layers of Hisamitsu are formed from a conductive paste of metallic or carbon fine particles, where "... it is preferable that the fluid for forming the collecting layer 212a on the side of the positive electrode layer 211a contains carbon fine particles, and the fluid for forming the collecting layer 212c on the side of the negative electrode layer 211c contains copper fine particles. ..." (para. 46; Fig. 2). One of ordinary skill in the art would readily appreciate that Hisamitsu

teaches a collector useful in a laminated, bipolar battery with a first type of electrically conductive particle contacting an anode and a second type of electrically conductive particle contacting a cathode.

Finally, as to applicant's arguments with respect to how the collector is produced, it is again noted that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

5. "Applicants have described above with respect to claim 24 how Munshi fails to teach or suggest such a collector [consisting essentially of an electrically conductive polymer]. ... Munshi teaches the use of a metal substrate. ... Applicants' claim requires that the collector consist essentially of an electrically conductive polymer. Munshi clearly describes a collector that has electrically conductive polymers as being metalized on both sides. Only the collector comprising a polymer that is impregnated with an electronically conductive element is referred to by Munshi in col. 22, ll.52-53: "metallization of the impregnated polymer substrate is optional." ... Applicant's further submit that Hisamitsu et al. fails to teach or suggest a collector consisting essentially of electrically conductive polymer. ... Accordingly, the combination fails to render the invention of claim 12 obvious. ..." (See Appeal Brief, p. 11-12.)

As applicant's arguments with respect to the Munshi reference, those arguments have been addressed above (see Paragraph 2).

Further, as to applicant's argument with respect to the Hisamitsu reference, Hisamitsu teaches that layers of its laminated, bipolar battery can be formed via an ink-jet method with fluids that include a polymer and a conductive material (para. 38, 44, 45). One of ordinary skill would appreciate that the ink-jet method described by Hisamitsu can be used to produce battery structures formed of a polymer and conductive material, such as that composing the collector recited in claim 12. Also, as to the remainder of applicant's arguments with respect to this reference, it is again noted that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the

references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

6. Neither Hwang et al. nor Usui cure the deficiencies of Munshi and Hisamitsu et al. as described above. (See Appeal Brief, p. 12-13.)

Applicant's arguments with respect to the Munshi and Hisamitsu references have been addressed above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Edu E. Enin-Okut/
Examiner, Art Unit 1727

Conferees:

/Dah-Wei D. Yuan/
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